

**ABSTRACT**

A system for estimating inputs and outputs of a digital transmission system is disclosed. The system includes a receiver front-end configured to receive an observed digital signal in the digital transmission system. The system  
5 further includes forward and backward recursion elements, at least one forward channel estimator, at least one backward channel estimator, and a combiner. The forward recursion element is adapted to receive the observed digital signal, and generate a first sequence of soft information by  
10 performing a forward recursion. The forward channel estimator is adapted to receive the observed digital signal and the first sequence of soft information, and to estimate channel parameters using the first sequence of soft  
15 information. The backward recursion element is adapted to receive the observed digital signal, and generate a second sequence of soft information by performing a backward recursion. The backward channel estimator is adapted to receive the observed digital signal and the second sequence  
20 of soft information, and to estimate channel parameters using the second sequence of soft information.

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